

Series : EF3GH



SET~3

रोल नं.
Roll No.



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- (I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **27** हैं।
- (II) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- (III) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **38** प्रश्न हैं।
- (IV) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में यथा स्थान पर प्रश्न का क्रमांक अवश्य लिखें।
- (V) इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक परीक्षार्थी केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।

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प्रश्न-पत्र कोड
Q.P. Code

430/3/3

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।

Candidates must write the Q.P. Code on the title page of the answer-book.

NOTE

- (I) Please check that this question paper contains **27** printed pages.
- (II) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- (III) Please check that this question paper contains **38** questions.
- (IV) Please write down the Serial Number of the question in the answer-book at the given place before attempting it.
- (V) 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.



गणित (बुनियादी)

MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80



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General Instructions :

Read the following instructions very carefully and strictly follow them :

- (i) This question paper contains **38** questions. **All** questions are **compulsory**.
- (ii) This question paper is divided into **five** Sections – **A, B, C, D** and **E**.
- (iii) In **Section A**, Questions no. **1** to **18** are Multiple Choice Questions (MCQs) and questions number **19** and **20** are Assertion-Reason based questions of **1** mark each.
- (iv) In **Section B**, Questions no. **21** to **25** are Very Short Answer (VSA) type questions, carrying **2** marks each.
- (v) In **Section C**, Questions no. **26** to **31** are Short Answer (SA) type questions, carrying **3** marks each.
- (vi) In **Section D**, Questions no. **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.
- (vii) In **Section E**, Questions no. **36** to **38** are case study based questions carrying **4** marks each. Internal choice is provided in **2** marks questions in each case study.
- (viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
- (ix) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.
- (x) Use of calculator is **not** allowed.

SECTION A

This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each. $20 \times 1 = 20$

1. The perimeter of a quadrant of a circle of circumference 22 cm is :
 - (A) 29 cm
 - (B) 22 cm
 - (C) 12.5 cm
 - (D) 5.5 cm
2. A cone and cylinder have same height and same radius. The volume of the cone and the volume of the cylinder are in the ratio :
 - (A) 1 : 1
 - (B) 1 : 3
 - (C) 3 : 1
 - (D) 1 : 2



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3. The following table shows the marks scored by 23 students of a class.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of Students	5	3	4	8	3

The lower limit of the modal class is :

- (A) 10 (B) 20
(C) 30 (D) 40
4. For a distribution, if mean = 15 and mode = 12, then its median is :
(A) 12
(B) 13
(C) 14
(D) 15
5. A pair of dice is thrown simultaneously. Let E denote the event that “The sum of numbers obtained on both dice is at least 9.” The number of outcomes in favour of event E is :
(A) 4
(B) 6
(C) 10
(D) 26
6. If $p = 2^3 \times 3^2 \times 5$ and $q = 2^2 \times 3^3$, then the LCM of p and q is :
(A) $2^3 \times 3^3$
(B) $2^2 \times 3^2$
(C) $2^2 \times 3^2 \times 5$
(D) $2^3 \times 3^3 \times 5$
7. 3^n , where n is a natural number, cannot end with the digit :
(A) 3 (B) 5
(C) 7 (D) 9



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8. A prime number has :

- (A) exactly two prime factors
- (B) exactly one prime factor
- (C) at least one prime factor
- (D) at least two prime factors

9. The system of linear equations given by $x = a$ and $y = b$ is :

- (A) Consistent with a unique solution.
- (B) Consistent with infinitely many solutions.
- (C) Consistent with two solutions.
- (D) Inconsistent.

10. If $(x + 1)^3 = x^3 + 1$ is expressed as a quadratic equation in the form $px^2 + qx + r = 0$, then the value of $p - q + r$ is :

- (A) 0
- (B) 1
- (C) 3
- (D) 6

11. If point $(a, 2b)$ is the mid-point of the line segment joining the points $(3, 5)$ and $(-1, -1)$, then (a, b) is equal to :

- (A) $(1, 2)$
- (B) $(2, 2)$
- (C) $(2, 1)$
- (D) $(1, 1)$

12. The distance of point $(-3, 4)$ from y-axis is :

- (A) -3
- (B) 3
- (C) 4
- (D) 5

13. The value of θ for which $\sin 2\theta = \tan 45^\circ$ is :

- (A) 22.5°
- (B) 30°
- (C) 45°
- (D) 90°

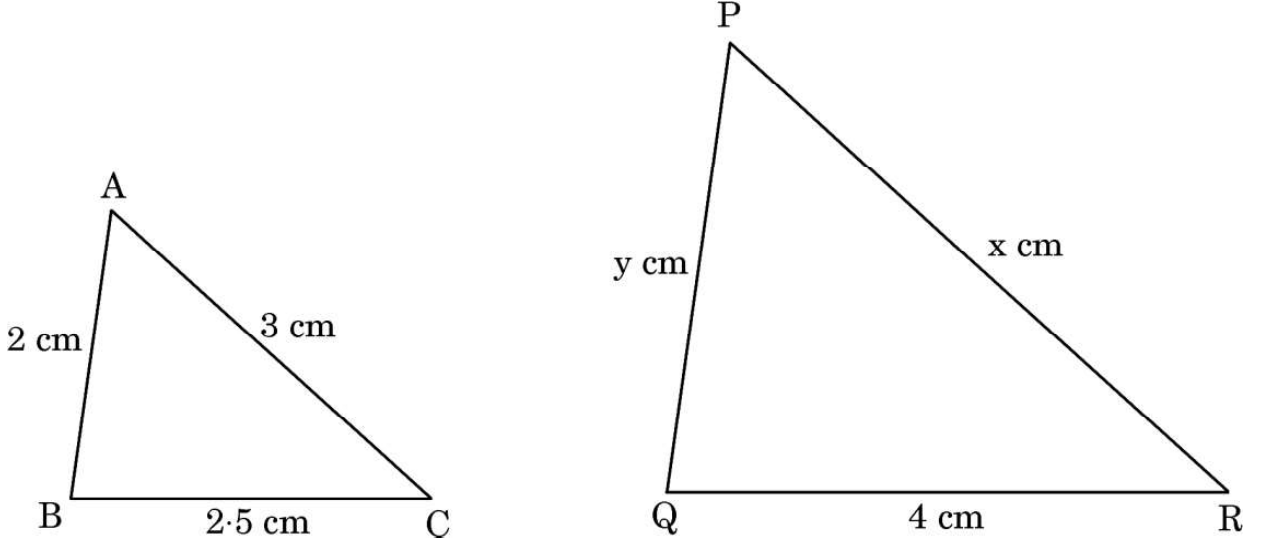


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14. निम्नलिखित में से किस प्रकार के त्रिभुज सदैव समरूप होते हैं ?

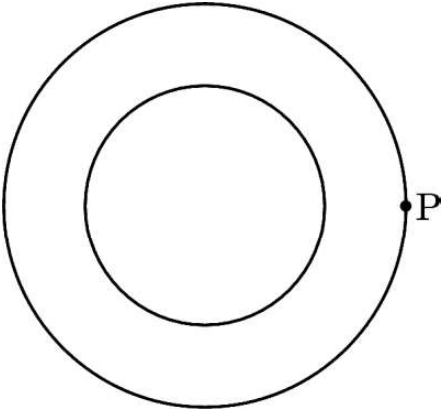
- (A) समकोण त्रिभुज
- (B) न्यूनकोण त्रिभुज
- (C) समद्विबाहु त्रिभुज
- (D) समबाहु त्रिभुज

15. नीचे दी गई आकृतियों में, x और y के किन मानों के लिए $\triangle ABC$ और $\triangle QRP$ समरूप होंगे ?



- (A) $x = 6, y = 5$
- (B) $x = 5, y = 6$
- (C) $x = 6, y = 6$
- (D) $x = 12, y = 3.2$

16. दी गई आकृति में, बाह्य वृत्त पर स्थित बिंदु P से अन्तः वृत्त पर कितनी स्पर्श-रेखाएँ खींची जा सकती हैं ?



- | | |
|-------|----------|
| (A) 0 | (B) 1 |
| (C) 2 | (D) अनंत |

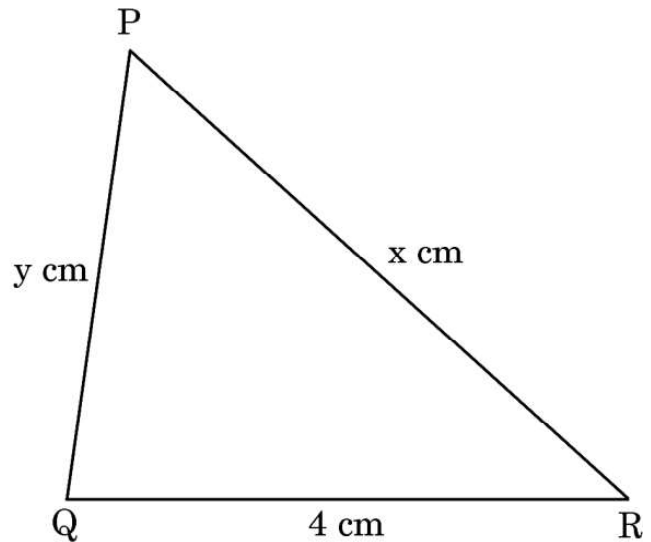
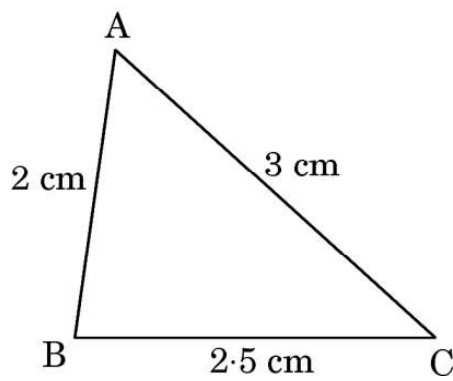


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14. Which types of triangles are always similar ?

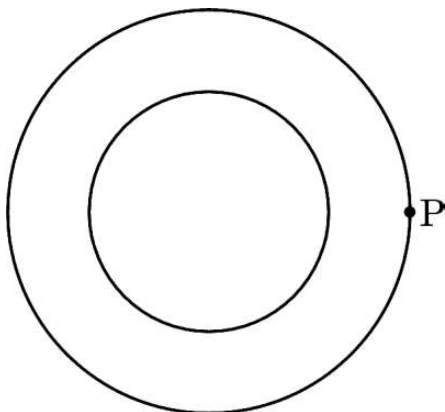
- (A) Right-angled triangles
- (B) Acute-angled triangles
- (C) Isosceles triangles
- (D) Equilateral triangles

15. What values of x and y will make $\triangle ABC$ similar to $\triangle QRP$ in the figures given below ?



- (A) $x = 6, y = 5$
- (B) $x = 5, y = 6$
- (C) $x = 6, y = 6$
- (D) $x = 12, y = 3.2$

16. How many tangents can be drawn from the point P on the outer circle to the inner circle in the given figure ?

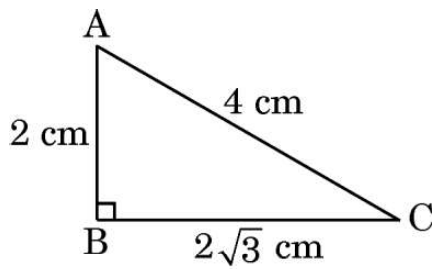


- | | |
|-------|--------------|
| (A) 0 | (B) 1 |
| (C) 2 | (D) Infinite |



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17. In the given figure, the angle of elevation of point A from point C is :



- (A) 30° (B) 45°
(C) 60° (D) Cannot be determined
18. The angle of the sector of a circle whose area is one-eighth of the area of the circle is :
- (A) $22\frac{1}{2}^\circ$ (B) 45°
(C) 60° (D) 90°

Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.
19. Assertion (A) : For an angle θ , $\sec \theta = 1 \Rightarrow \tan \theta = 0$.
Reason (R) : $\sec^2 \theta + \tan^2 \theta = 1$.
20. Assertion (A) : Every quadratic equation has two real roots.
Reason (R) : A quadratic polynomial can have at most two zeroes.



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SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each. $5 \times 2 = 10$

21. From a circular sheet of radius 10 cm, a quadrant is cut. Find the perimeter of the remaining sheet.

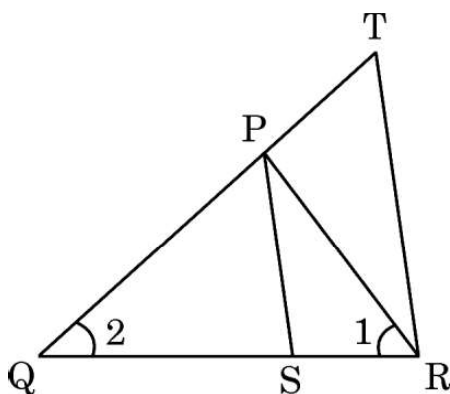
22. Solve the following system of linear equations graphically :

$$x + y = 5 \text{ and } x - y = 3$$

23. (a) A vertical pole of height 10 m casts a shadow of 15 m on the ground and at the same time, a tower casts a shadow of 45 m on the ground. Find the height of the tower.

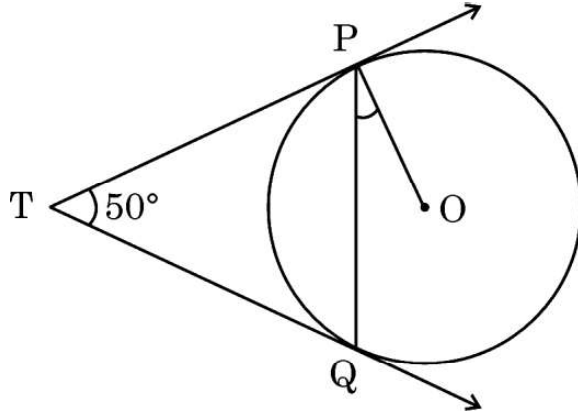
OR

(b) In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Prove that $\triangle PQS \sim \triangle TQR$.



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24. दी गई आकृति में, TP और TQ दो स्पर्श-रेखाएँ हैं। यदि $\angle PTQ = 50^\circ$ है, तो $\angle OPQ$ की माप ज्ञात कीजिए।



25. (क) यदि $\sin 3A = 1$ है, तो $\cos 2A - \tan^2 45^\circ$ का मान ज्ञात कीजिए।

अथवा

- (ख) यदि $(\sec A + \tan A)(1 - \sin A) = k \cos A$ है, तो k का मान ज्ञात कीजिए।

खण्ड ग

इस खण्ड में 6 लघु-उत्तरीय (SA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 3 अंक हैं।

$6 \times 3 = 18$

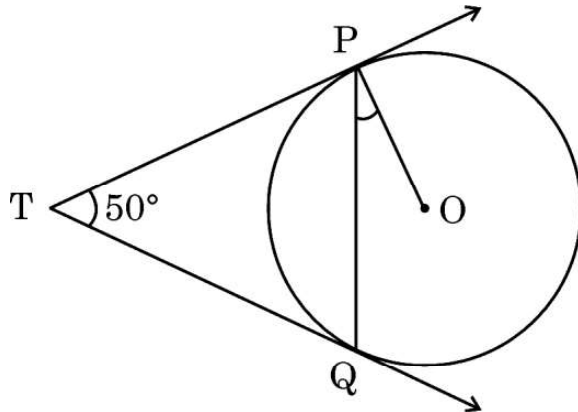
26. एक डिब्बे में 6 नीले, 4 सफेद और 8 लाल कंचे हैं। एक कंचा इस डिब्बे से यादृच्छया निकाला जाता है। प्रायिकता ज्ञात कीजिए कि निकाला गया कंचा :

- (i) सफेद है
- (ii) सफेद या लाल है
- (iii) लाल नहीं है



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24. In the given figure, TP and TQ are two tangents. If $\angle PTQ = 50^\circ$, then find the measure of $\angle OPQ$.



25. (a) If $\sin 3A = 1$, then find the value of $\cos 2A - \tan^2 45^\circ$.

OR

- (b) If $(\sec A + \tan A)(1 - \sin A) = k \cos A$, then find the value of k.

SECTION C

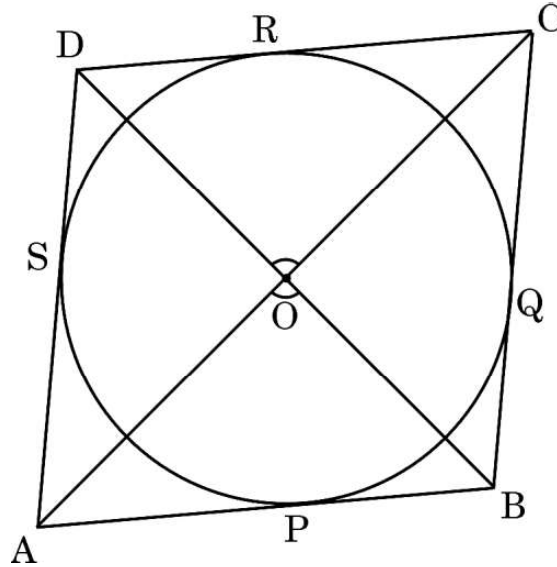
This section has 6 Short Answer (SA) type questions carrying 3 marks each. $6 \times 3 = 18$

26. A box contains 6 blue, 4 white and 8 red marbles. A marble is drawn at random from this box. Find the probability that the marble so drawn is :
- (i) white
 - (ii) white or red
 - (iii) not red



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27. In the given figure, a circle is inscribed in a quadrilateral ABCD which touches the sides AB, BC, CD and DA at P, Q, R and S respectively. Prove that $\angle AOB + \angle COD = 180^\circ$.



28. (a) Prove that $\sqrt{2}$ is an irrational number.
- OR**
- (b) Find which among the following numbers a, b and c is/are composite numbers.

$$a = 7 \times 11 \times 13 + 13$$

$$b = 6 \times 5 \times 4 + 4$$

$$c = 7 \times 13 + 6$$

29. Find the zeroes of the polynomial $25a^2 - 10a + 1$ and verify the relationship between the zeroes and coefficients of the given polynomial.
30. (a) A fraction becomes $\frac{1}{3}$, when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$, when 8 is added to its denominator. Find the fraction.

OR

- (b) Find the value of k for which the following pair of linear equations will have infinitely many solutions :

$$kx + 3y - (k - 3) = 0 \text{ and } 12x + ky - k = 0$$

Hence, find any two solutions of the given pair of equations.



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31. निम्नलिखित त्रिकोणमितीय सर्वसमिका को सिद्ध कीजिए :

$$\frac{\tan \theta}{1 + \cot \theta} + \frac{\cot \theta}{1 + \tan \theta} = \tan \theta + \cot \theta - 1$$

खण्ड घ

इस खण्ड में 4 दीर्घ-उत्तरीय (LA) प्रकार के प्रश्न हैं, जिनमें प्रत्येक के 5 अंक हैं।

4×5=20

32. निम्नलिखित तालिका में एक मोहल्ले के 25 परिवारों के दैनिक खर्च का विवरण दिया गया है।

दैनिक खर्च (₹ में)	परिवारों की संख्या
500 – 750	4
750 – 1000	2x + 1
1000 – 1250	12
1250 – 1500	x
1500 – 1750	2

x का मान ज्ञात कीजिए और इसके पश्चात माध्य दैनिक खर्च भी ज्ञात कीजिए।

33. (क) दो क्रमागत विषम पूर्णांक ज्ञात कीजिए जिनके वर्गों का योगफल 290 है।

अथवा

(ख) एक दानी (चैरीटी) ट्रस्ट फैसला करता है कि उन्हें एक आयताकार हॉल, जिसका क्षेत्रफल 300 m² हो, बनाना है। हॉल की लम्बाई, इसकी चौड़ाई के दुगुने से एक मीटर अधिक होनी है। हॉल की लम्बाई और चौड़ाई ज्ञात कीजिए।



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31. Prove the following trigonometric identity :

$$\frac{\tan \theta}{1 + \cot \theta} + \frac{\cot \theta}{1 + \tan \theta} = \tan \theta + \cot \theta - 1$$

SECTION D

This section has 4 Long Answer (LA) type questions carrying 5 marks each. 4×5=20

32. The following table shows the daily expenditure of 25 households of a locality.

Daily Expenditure (in ₹)	Number of Households
500 – 750	4
750 – 1000	2x + 1
1000 – 1250	12
1250 – 1500	x
1500 – 1750	2

Find the value of x. Hence find the mean daily expenditure.

33. (a) Find two consecutive odd integers, sum of whose squares is 290.

OR

- (b) A charity trust decides to build a rectangular hall having an area of 300 m². The length of the hall is one metre more than twice its width. Find the length and breadth of the hall.

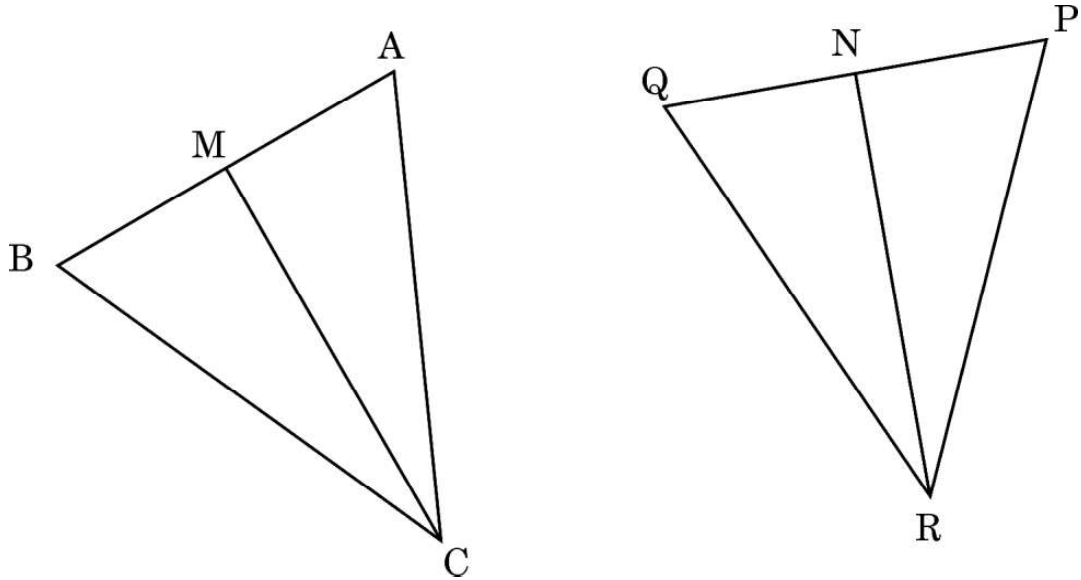


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34. (a) State and Prove “Basic Proportionality Theorem”.

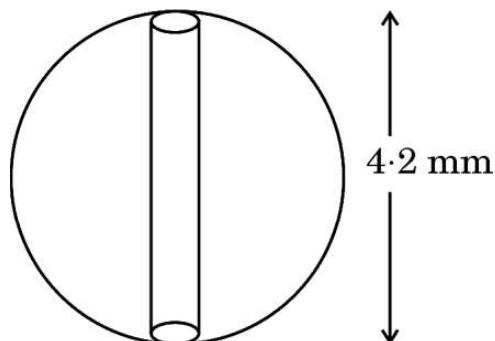
OR

- (b) In the given figure, CM and RN are respectively, the medians of $\triangle ABC$ and $\triangle PQR$. If $\triangle ABC \sim \triangle PQR$, prove that :



- (i) $\triangle AMC \sim \triangle PNR$
- (ii) $\angle BCM = \angle QRN$
- (iii) $\triangle BMC \sim \triangle QNR$

35. A necklace is made up of wooden beads. Each bead is in the form of a sphere of diameter 4.2 mm. A cylinder is hollowed out from each bead. If the radius of the cylinder is 1 mm, find the volume of wood left in each bead.



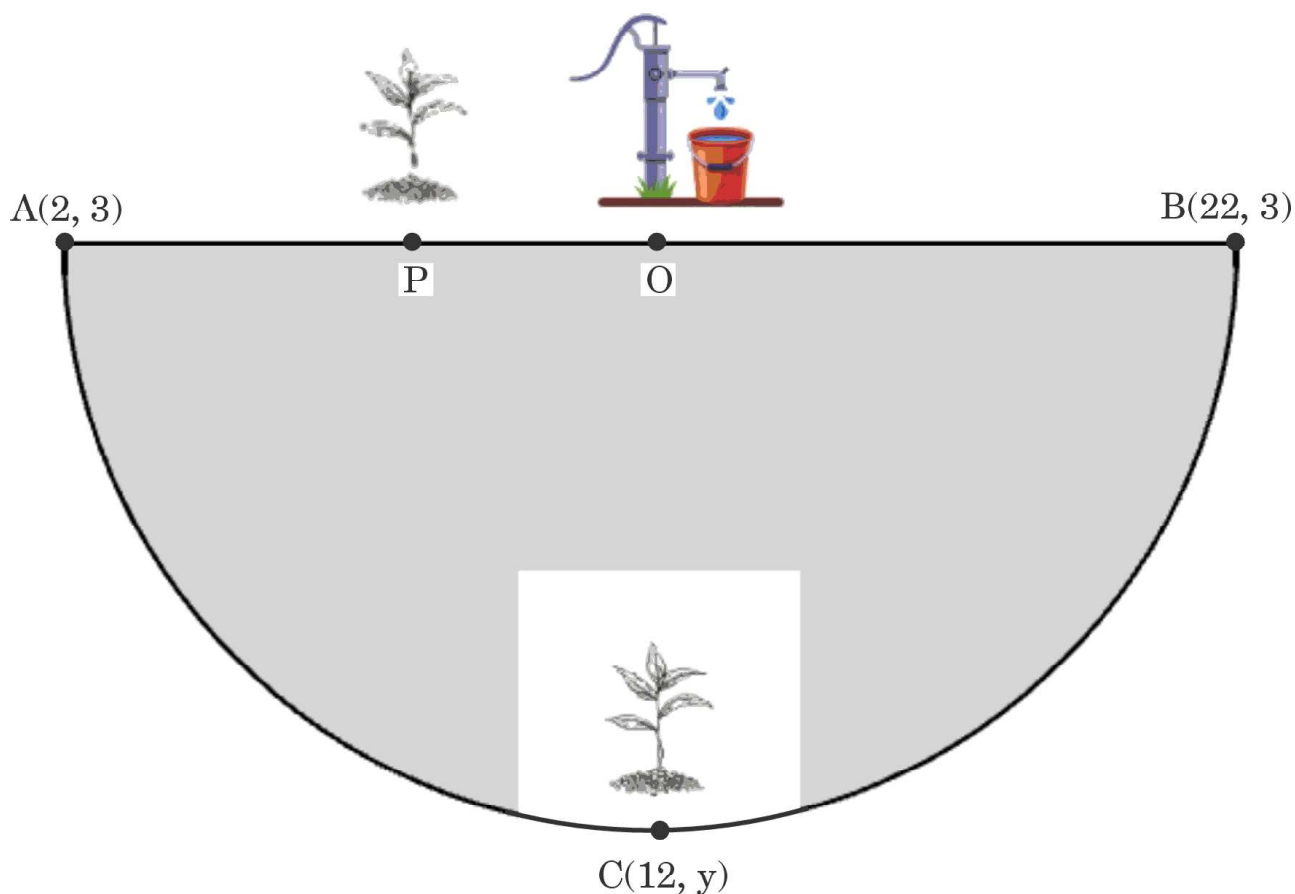
SECTION E

This section has **3** case study based questions carrying **4** marks each.

$3 \times 4 = 12$

Case Study – 1

- 36.** There is a semicircular park in Aman's society. He wishes to plant saplings along the boundary of the park. There is a borewell at the centre O of the park along the diameter AB as shown in the figure below.



Based on the above information, answer the following questions :

- | | | |
|-----------|---|---|
| (i) | Find the coordinates of point O. | 1 |
| (ii) | Find the radius of the semicircular park. | 1 |
| (iii) (a) | One sapling is kept at point C(12, y). Find the coordinates of C. | 2 |

OR

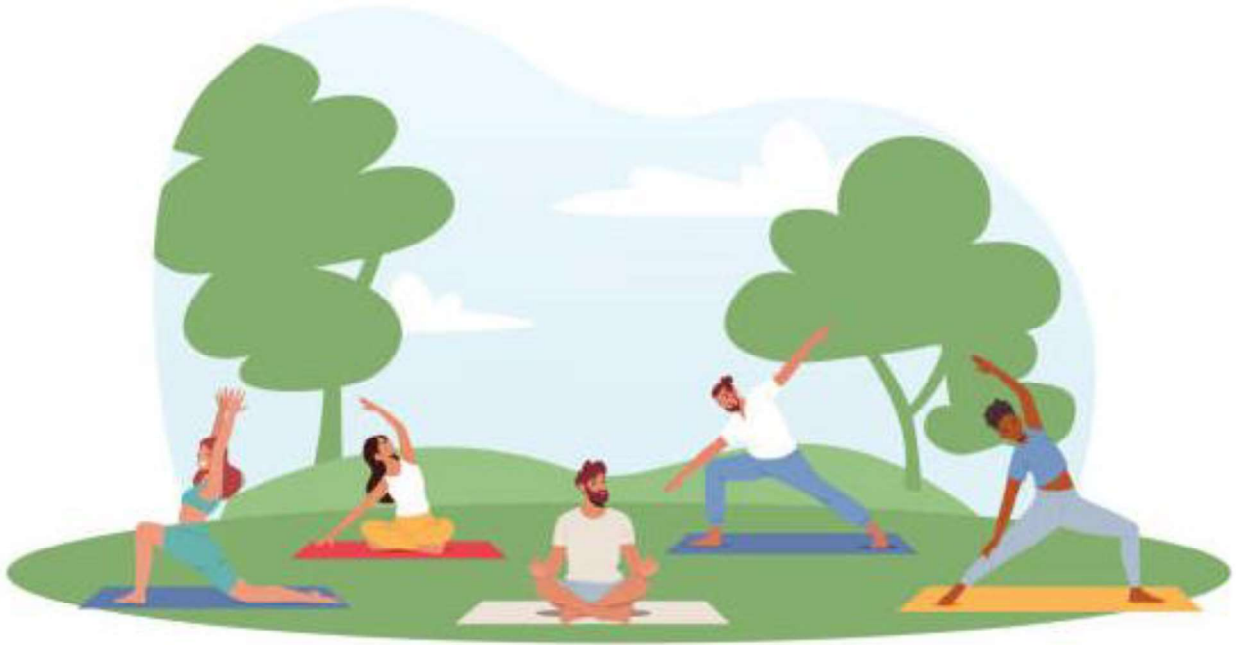
- | | | |
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| (b) | One sapling is kept at point P along AB so that $PA = \frac{1}{3} PB$.
Find the coordinates of P. | 2 |
|-----|---|---|



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Case Study – 2

37. In a society, a yoga instructor was hired to train the people of the society to live a healthy lifestyle. Yoga sessions were held daily from 5 p.m. to 7 p.m. in the society park. On day one, 5 people joined the yoga session, on day two, 3 more people joined, on day three, another 3 people joined and in this manner every next day, 3 more people kept on joining.



Based on the given information, answer the following questions :

- | | | |
|-------|---|---|
| (i) | On which day did 59 people join the yoga session ? | 1 |
| (ii) | How many people joined the yoga session on the 31 st day ? | 1 |
| (iii) | (a) The yoga instructor was paid ₹100 for each person attending the yoga session. On which day would he earn ₹5,000 ? | 2 |

OR

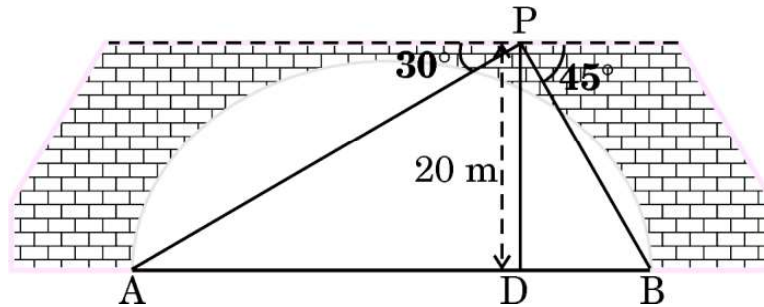
- | | | |
|-----|--|---|
| (b) | What was the total amount earned by the yoga instructor in 16 days ? | 2 |
|-----|--|---|



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Case Study – 3

38. Two motorboats A and B are waiting at the opposite banks of a river in order to reach the opposite side. From a point P on the bridge, 20 m above the river, the angles of depression of the boats are 30° and 45° respectively, as shown in the figure given below. Both the boats leave at the same time at the speed of 10 m/s and 5 m/s, respectively



Based on the above information, answer the following questions :

- (i) Find the distance travelled by boat A to reach point D in the river, vertically below the point P. (Use $\sqrt{3} = 1.73$) 1
- (ii) What is the width of the river ? 1
- (iii) (a) Which boat will reach point D first, and how much earlier, than the other boat ? 2

OR

- (b) What is the distance between the two boats after 3 seconds ? 2

